

## 904 BITUMINOUS EQUIPMENT

### 904.01 BITUMINOUS MIXING PLANTS

**(A) GENERAL.** Plants used for the preparation of hot mix bituminous mixtures shall be a batch, continuous or drum type. The plant shall be approved prior to use and conform to the appropriate sections of AASHTO M 156.

The plant shall be of sufficient capacity to adequately handle the proposed construction and be maintained in good mechanical condition. Any defects which adversely affect the proper function of the plant or the quality of the mixture shall be repaired immediately.

The plant shall be equipped with all necessary scales, measures, and weighing devices to insure proper proportioning of all ingredients and shall be so designed, coordinated, and operated to produce a mixture within the job mix tolerances. Testing and checking these weighing devices and meters shall be done in the presence of the Engineer.

The plant shall be equipped with a laboratory in accordance with 106.06.

All moving parts, pulleys, belts, and drive mechanisms shall be covered or otherwise protected. Stairways and platforms shall be unobstructed and have secure handrails. Particles shall be controlled within the requirements of Environmental Protection Agency. Dust collectors are required. Baghouse fines, when used, shall be recirculated to the mineral filler bin.

**(B) SCREENING.** In batch plants, the aggregates, immediately after heating, shall be screened into 3 or more fractions and conveyed into separate compartments. In any compartment there shall be not more than 5 percent of the aggregate larger than the screen controlling the top size of the material nor more than 20 percent smaller than the screen size controlling the smallest material for the particular separation. Plants provided with a suitable number of cold storage bins equipped with adequate tell-tale devices where needed for remote control operations, and with properly controlled proportional feed systems, may be used to blend the coarse and fine aggregates respectively to give the specified gradation.

When continuous mixing plants are used, a minimum of three aggregate cold feed bins shall be used to proportion aggregates to obtain the specified gradation.

**(C) SURGE AND STORAGE BINS.** The Contractor may elect to store hot mixed bituminous concrete in a surge or storage bin provided said bin has received prior evaluation and approval by the Engineer. Use of the bin is to be in conformance with all limitations on retention time, type of mixture, heater operation, bin atmosphere, bin level, or other characteristics set forth in the applicable specifications. Affixed to each bin and visible from the Inspector's office and to the loading operator shall be an indicating device, which will be activated when the material in the bin drops below the top of the sloped portion of the bin.

An evaluation of a surge or storage unit will determine the degree of composition uniformity, temperature characteristics, and degree of asphalt cement hardening of mixture processed through the surge or storage unit. Approval will be granted for bin usage that consistently results in mixtures having gradation and temperature properties of no less quality than specified mixtures discharged directly from the plant's mixing operation and resulting in asphalt hardening properties which do not exceed the limits

specified below. Materials for use as open graded coarse material should not be stored because of the likelihood of asphalt migration. Mixtures which the Engineer determines visually to be segregated will be rejected.

Asphalt hardening due to storage shall not exceed 10 per cent of the original values determined on the asphalt prior to mixing.

Original asphalt properties shall be determined from samples of asphalt taken prior to incorporation into the mix. Test procedures shall be in accordance with AASHTO M 20 or M 226, whichever is applicable as determined by the Engineer.

The amount of hardening due to storage shall be determined by comparison of tests on samples of the mixtures taken after exit from the pugmill or drum but before entry into the storage bin and samples taken after exit from the storage bin.

When asphalt hardening, due to mixing, exceeds the amount allowed for original asphalt by AASHTO M 20 or M 226, whichever is applicable, use of a bin for other than as a surge bin will not be permitted unless storage can be determined to have no significant effect on asphalt hardening.

Recovery of asphalt from the mixture shall be in accordance with AASHTO T 164 and T 170.

The system shall be capable of conveying the hot mix from the plant to the storage bins and storing the hot-mix without a loss in temperature, segregation of the mix, or oxidation of the mix.

Samples for penetration or viscosity tests shall be taken from trucks loaded from the surge or storage bin or mixing operation, chilled immediately and maintained at a temperature of 32° F or less until tested.

The conveyor system may be a continuous type or a skip bucket type. If the continuous type is used, it shall be enclosed and heated to prevent a drop in temperature. If the skip bucket type is used, the bucket must be of sufficient capacity to transport an entire batch and mass dump it into the bins.

Storage and surge bins shall be designed in such a manner as to prevent segregation of the hot-mix during discharge from the conveyor into the bins and shall be equipped with discharge gates that will not cause segregation of the hot- mix while loading the mix into the trucks.

To prevent oxidation of the mix, each storage bin, in which any portion of the material is to be stored longer than 12 hours, shall be equipped with an inert gas system which will replace the natural internal atmosphere with a gas having little or no oxygen content and then seal the bins to prevent the loss of the inert gas. The storage bin heating system shall be capable of maintaining the mix temperature without localizing heating (hot spots).

Material may be stored for no more than 12 hours in a surge bin without a heating system and an inert gas system.

**(D) TEMPORARY USE OF UNAPPROVED BINS.** In the event that a bin is permitted to be used prior to evaluation and approval, the following maximum storage times are to be used:

**Fine Mix  
Max Size**

**Coarse Mix  
Max Size**

	(1/2") HOURS	(1-1/2") HOURS
Asphalt, air in bin	8	4
Asphalt, inert gas in bin	12	6

## **904.02 TRUCKS FOR TRANSPORTING BITUMINOUS MIXTURES**

Trucks for transporting bituminous mixtures shall have a solid metal, dump type bed. The bed shall be clean and smooth, and have a tight fitting rear gate to prevent loss of materials while in transit.

The inside surface of the bed shall be sprayed with a minimum amount of an approved oil, detergent, or a mixture of lime and water proportioned at a rate of 100 pounds of lime to 50 gallons of water prior to loading to prevent adhesion of the mixture to the bed. Kerosene and gasoline will not be approved nor will the use of excessive quantities of approved oil be permitted.

Each truck shall be equipped with a canvas or other suitable material of sufficient size to cover the material and protect it from the weather. Between November 1 and March 15, the truck bodies shall be insulated to prevent temperature loss while in transit. The trucks shall not have appreciable oil leakage that may cause damage to the new bituminous construction.

A hole 1/4 to 1/2 inch in diameter shall be provided in the truck bed at an appropriate height to facilitate the insertion of an asphalt thermometer.

All trucks shall be equipped with a back-up alarm meeting D.C. safety code.

## **904.03 PRESSURE DISTRIBUTOR**

Distributors used for the application of bituminous materials shall be of the pressure type mounted on trucks or semitrailers equipped with pneumatic tires. The tires shall have sufficient width of rubber in contact with the prepared road surface to avoid breaking the bond or of forming a rut in the surface. The rear axles of semitrailer units shall be mounted on dual wheels.

The distributor shall be equipped with a suitable means to provide a uniform temperature of the entire mass of material. The heating unit shall be so designed as to heat the bituminous material without burning or overheating any portion and with effective and positive control of the heat at all times. The distributor shall be provided with at least one thermometer which shall be maintained in good condition at all times and so placed as to register accurately the temperature of the tank content.

The distributor shall be so constructed and operated as to be capable of evenly and uniformly applying accurately measured quantities from 0.05 to 1 gallon of bituminous material per square yard of surface. The specified rate of application shall be maintained during the distribution of the entire load regardless of change in gradient or direction.

The spray bar and nozzle shall be of such size as to insure uniform distribution of the material in specified quantities and the nozzles shall be of a design as to issue a fan-shaped spray without streaks or bare spots. A strainer shall be provided in the discharge line to prevent the nozzles from becoming clogged.

The distributor shall be equipped with a tachometer which will show the speed in feet per minute. It shall be so located as to be easily visible to the truck driver to enable him to maintain the constant speed necessary for the correct application of the specified quantity of material.

A pressure gauge shall be provided to indicate accurately the pressure at which the bituminous material is applied. If an air-pressure type distributor is used, the air relief valve shall be discharging at all times during the distributing operations. All distributors, except those of the air-pressure type, shall be equipped with auxiliary motors for pumping material to the spray bars.

The distributor shall be so designed that the application of bituminous material can be started and stopped instantly at all nozzles without dribbling and without the driver leaving his seat. It shall have sufficient pressure to provide a spray that will cover completely and uniformly the entire surface receiving the application.

A hand spray bar and nozzle attachment capable of operating under the required pressure and which can be gaged shall be provided with the distributor. It shall consist of a suitable length of flexible steel hose with packed couplings and will be used for touching up spots inaccessible to or unavoidably missed by the distributor.

#### **904.04 BITUMINOUS PAVERS**

Bituminous pavers shall be self-contained, power-propelled units, provided with an activated screed or strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thicknesses shown on the plans. The pavers shall be equipped with adjustments of the manufacturer's standard design which will permit the bituminous material to be spread and finished in widths shown on the plans. The machine shall be capable of placing a minimum width of 8 feet.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The paver shall be equipped with automatic feed controls, properly adjusted to maintain a uniform depth of material ahead of the screed.

The screed or strike off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture.

All pavers shall be equipped with automatic screed controls with sensors for either or both sides of the paver, capable of sensing grade from an outside reference line, sensing the transverse slope of the screed and providing the automatic signals which operate the screed to maintain the desired grade and transverse slope. The sensor shall be so constructed that it will operate from a reference line or a ski-like arrangement.

The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent.

Manual operation may be permitted by the Engineer in the construction of irregularly shaped and minor areas.

Whenever a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for the remainder of the normal working day on which the breakdown or malfunction occurred provided this method of operation will produce results otherwise meeting specifications.

Reference lines will be required for both outer edges of the traveled way for each main line roadway for vertical control. Horizontal control utilizing the reference line will be permitted. The grade and slope for intermediate lanes shall be controlled automatically from reference lines or by means of a ski and a slope control device or a dual ski arrangement. When the finish of the grade prepared for paving is superior to the established tolerance and when, in the opinion of the Engineer, further improvement to the line, grade, cross sections, and smoothness can best be achieved without the use of the reference line, a ski-like arrangement may be substituted subject to the continued approval of the Engineer. The use of the reference lines shall be reinstated immediately whenever the Contractor fails to maintain a superior pavement. The Contractor shall furnish and install all pins, brackets, tensioning devices, wire, and accessories necessary for satisfactory operation of the automatic control equipment.

## **904.05 ASPHALT ROLLERS**

Asphalt Rollers shall be steel wheel, pneumatic tired or vibratory or a combination thereof. The roller(s) shall be in good condition, capable of reversing without backlash, and shall be operated at speeds slow enough to avoid displacement and compact the mixture to the required density while it is still in a workable condition. Vibratory rollers shall not be used on surface mixes. The use of any equipment which results in excessive crushing of the aggregate will not be permitted.

**(A) THREE-WHEELED FINISHING ROLLER AND TWO AND THREE AXLE TANDEM ROLLERS.** Rollers of these types shall be of rigid construction. Three- wheeled finishing rollers shall be designed especially for use on bituminous construction. Tandem rollers shall have a low center of gravity and be balanced on the longitudinal axis.

All rollers of this type shall be equipped with a water sprinkling system with a tank capacity as approved by the Engineer. The tank shall be placed on the three-wheeled finishing roller in such a manner that not more than 75 per cent of the combined weight of tank and contents shall be distributed on the rear axle.

The water shall be piped to the spray pipes on each roll. The spray pipe shall extend the full width of the roll and shall be so installed as to be readily cleanable. The water shall be distributed from the spray pipes through cocoa-fiber mats securely suspended against the rolling surface. Separate valves shall control the flow of water to each roll and if enough pressure is not secured by force of gravity, some satisfactory pressure device shall be installed.

Tandem rollers shall have smooth operating friction clutches of the reversing type, smooth operating brakes and both hand and power operated steering devices. The driving mechanism shall be such as to give the lowest side clearance possible. For three-axle tandem rollers, both guide rolls shall be steerable and the ratio of steering shall be synchronized.

For tandem rollers, the distribution of weight shall be such that not more than 68 percent of the total gross weight be placed upon the drive roll. For three-wheeled finished rollers the distribution of weight shall be such that not more than 72 percent of the total gross weight will be carried on the rear axle.

The minimum compression required per inch of width of drive roll may include only the net operating weight of roller.

Three axle tandem rollers shall be equipped with a locking device which locks all wheels in the same place.

**(B) SELF-PROPELLED PNEUMATIC-TIRED ROLLER.** Pneumatic tired rollers shall be of a multi-axle, multi-wheel type with smooth-tread pneumatic tires of equal size staggered on the axles at such spacings and overlaps as will provide uniform compactive pressure for the full compacting width of the roller, when operating. Oscillation of the wheels shall be provided in vertical plane only. The pneumatic tired roller shall be capable of being ballasted to the proper weight.

All tires shall be inflated to equal air pressure, within a tolerance of 5 psi, and to the pressure designated for use. The roller shall provide the compactive ground pressure per square inch which is most efficient under the conditions and for the purpose of its use, as designated by the Engineer.

The roller shall be equipped with a water tank and sprinkler system which will keep the wheel uniformly wet.

The Contractor shall furnish to the Engineer charts or tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of tire loadings for each tire and size compactor tire furnished.

**(C) VIBRATING ROLLERS FOR ASPHALT.** In addition to the requirements of 902.04, vibrating rollers used on asphalt shall be equipped with a water system which will keep the wheels wet as necessary to prevent the bituminous mixture from sticking to them.

## **904.06 HAND TOOLS FOR FINISHING ASPHALT SURFACES**

**(A) ASPHALT LUTE.** The asphalt lute shall be of aluminum or wood with a rigid blade 3 to 6 feet in length, and 6 inches in width. The blade shall be edged on the contact surface. The handle, to one end of which the blade shall be firmly affixed with adequate bracing, shall be 16 feet in length.

**(B) RAKES.** Rakes shall be made of metal and shall be not less than 14 inches wide. The tines shall be of sufficient depth to penetrate and rake the material for its full depth.

**(C) SMOOTHING IRONS.** Smoothing irons shall be made of metal and shall weigh not less than 40 pounds. The bearing surface shall be not less than 80 square inches.

**(D) HAND TAMPERS.** Hand tampers for compaction of bituminous material in locations inaccessible to rollers shall be of metal construction, weigh not less than 25 pounds and shall have tamping face of not less than 48 square inches.